

WHAT IS CLAIMED IS:

1. A fuel cell system, which has a fuel cell that generates electrical power by the electrochemical reaction between the fuel gas supplied to the anode and the oxidant gas supplied to the cathode, and a humidifying apparatus that humidifies the gases with water permeable membranes, comprising:

a first humidifier, which is provided in said humidifying apparatus; and

non-porous water permeable membranes, which are provided in said first humidifier and humidify said fuel gas supplied to said anode by means of the moisture contained off-gas discharged from said fuel cell.

2. The fuel cell system according to claim 1, wherein:

said humidifying apparatus has a second humidifier; and

said second humidifier has porous water permeable membranes, which humidify said oxidant gas supplied to said cathode by means of said off-gas.

3. The fuel cell system according to claim 2, wherein:

said first and second humidifiers are so disposed in said humidifying apparatus that said off-gas first passes through said first humidifier and then reaches said second humidifier.

4. The fuel cell system according to claim 2, wherein:

said fuel cell system, said first humidifier and said second humidifier are disposed in series for the flow of said off-gas.

5. The fuel cell system according to claims 1 through 4, wherein:

said off-gas is discharged from the cathode.

6. A method of humidifying the fuel and oxidant gases supplied to a fuel
cell in a humidifying apparatus, comprising:

introduction of the moisture contained off-gas discharged from said
fuel cell into said humidifying apparatus;

moisture reception of said fuel gas from said off-gas through non-porous
water permeable membranes in said humidifying apparatus;

moisture reception of said oxidant gas from said off-gas through water
permeable membranes in said humidifying apparatus; and

supply of said respective humidified fuel and oxidant gases to said fuel
cell.

7. The humidifying apparatus according to claims 1 through 4 and claim 6
wherein;

said non-porous water permeable membranes transport water by ion
hydration.

8. The humidifying apparatus according to claim 5 wherein;

said non-porous water permeable membranes transport water by ion
hydration.

9. The fuel cell system according to claims 2 through 4, wherein:

said porous water permeable membranes transport water by capillary
condensation.

10. A fuel cell system, which has a fuel cell that generates electrical power by the electrochemical reaction between the fuel gas supplied to the anode and the oxidant gas supplied to the cathode, and a humidifying apparatus that humidifies the gases with water permeable membranes, comprising:

5 a first humidifier, which is provided in said humidifying apparatus and humidifies said fuel gas supplied to said anode by means of the moisture contained off-gas discharged from said fuel cell; and

a second humidifier, which is provided in said humidifying apparatus and humidifies said oxidant gas supplied to said cathode by means of the off-gas having passed through said first humidifier.

11. A method of humidifying the fuel and oxidant gases supplied to a fuel cell in a humidifying apparatus, comprising:

introduction of the moisture contained off-gas discharged from said fuel cell into said humidifying apparatus;

15 moisture reception of said fuel gas from said off-gas through water permeable membranes in said humidifying apparatus;

moisture reception of said oxidant gas from said off-gas through water permeable membranes in said humidifying apparatus; and

20 supply of respective said humidified fuel and oxidant gases to said fuel cell.